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Jessica Juarez
Iowa State University

Leo L. Timms
Iowa State University

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Evaluation of Teat Protection Persistency of an Experimental Novel Dry Cow Teat Dip System

A.S. Leaflet R2713

Jessie Juarez, graduate student in animal science;
Leo Timms, professor of animal science

Summary and Implications

Mastitis research has shown 40-50% of intramammary infections (IMI) are contracted during the dry or non-lactating period with the greatest percentages of these occurring during the first and last two weeks of the dry period. The ability to develop and apply external persistent barrier teat dip products (that can persist for these 1 week periods could decrease IMI, thus improving animal health and performance, and product quality and safety.

Specific aim of this study was to evaluate the persistency of teat protection of a novel experimental dry cow teat dip system (2 products dipped sequentially to form a persistent barrier; Zurex Pharma, Inc.). The compounds were easy to apply and formed a nice polymerized film. However, only 1/24 teats had dip films on @ 12 hrs post dipping with most films cracking, peeling, or completely removed by that time.

Introduction

Mastitis research has shown 40-50% of intramammary infections (IMI) are contracted during the dry or non-lactating period with the greatest percentages of these occurring the first and last two weeks of the dry period. At these times, the mammary gland is in a transitional state. Immunological factors are preoccupied or suppressed, milk is not being flushed from the gland, and increased mammary pressure distends the teat, thus allowing for easier bacterial penetration through the streak canal. Both external persistent sealant (2-5 day adherence) dips and internal teat sealants have been developed and shown to decrease IMI rates, especially environmental mastitis, in dry cows/springing heifers during the early dry and late prepartum periods when used properly. The ability to develop and apply external persistent barrier teat dip products (like a liquid bandage) that can persist for these 1 week periods could decrease IMI, thus improving animal health and performance, and product quality and safety. Specific aim of this study was to evaluate persistency of teat protection of a novel experimental dry cow teat dip system (2 products dipped sequentially to form a persistent barrier.

Materials and Methods

1. Dips or products used: A two product dip system was utilized. The initial dip was Z6015 A (blue liquid) followed by dipping with Z6015 B (clear liquid that

reacted with Z6015 A to polymerize) (Zurex Pharma, Inc.).

2. Cows: All protocols were approved by ISU Committee on Animal Care (IACUC # 10-06-6229-B). 6 Holstein dry cows at the ISU dairy were used for the study.
3. Trial design and farm practices: Dry cows were restrained in headlocks at feeding time in the Dry Cow / Transition Barn at ISU Dairy. Teats were dry wiped with a terry cloth towel, then disinfected with a cotton pledget moistened with 70% ethanol, then allowed to air dry. Teat skin and teat end health were assessed prior to teat dip application. All 4 teats of an individual cow were then teat dipped with Z6015 A (blue liquid dip). This was immediately followed by dipping those same teats with Z6015 B (clear liquid that polymerized on the teat). Visual observations on the product were made at this time.
4. Persistency of the teat dip to protect the teat : Evaluated at 12 and 24 hrs. post initial dipping, then daily thereafter until all teats were unprotected or dip was completely absent from teat ends. Scores assigned to dip protection were: 4 = dip completely on teat as dipped; 3 = teat length 2/3 protected with dip ($> 1''$); 2 = teat length 1/3 protected with dip ($< 1''$); 1 = teat end protected only; and 0 = dip completely removed or no covering of teat end (see picture on following page).
5. Other observations regarding the film consistency or patency of the dip (film together as one piece vs, cracking / flaking and other aberrations in teat dip film consistency) were recorded.

Results and Discussion

1. Teat dip observations at initial dipping: Both dip products were very fluent and easy to apply. Upon dipping with product B, the film was polymerized in $< 10-15$ seconds (impressive). However, the resulting dip film was very thick, not very consistent in its thickness and patency on the teat, and often resulted in polymerized strands of dip hanging from the teat. No photographs were taken at this time (but will be in future projects and trials).
2. Teat dip persistency results and observations: Only 1 / 24 teats still had dip residues on them at 12 hours post initial dipping with all other teats having dip fully removed. The one teat with dip on @ 12 hours (see picture below) had no dip presence at @ 24 hrs. post dipping. The dip showed evidence of a lot of drying, flaking, and cracking which can serve to enhance bacterial and environmental contamination of teats rather than protect them.



3. Potential reasons for dip's failure to persist on teat skin and ends:

- a) Initial thickness, weight, consistency of dip, and the stranding/ stringing: Having a consistent uniform film with limited stranding (strands have tendency to rub and be pulled when animal lies down, thus putting tension on the product) is essential to enhanced persistency.
- b) Inherent ability to adhere to teat skin: We have tested many products that seem to adhere to inanimate objects (test tubes, etc) and even human skin, but fail to adhere very long on bovine teat skin (unique secretions, tissue turnover, etc).

c) Ability of dip to remain as a single pieced film (flexible, pliable, and not drying/ cracking/ flaking): Relates to teat skin conditions as well as base characteristics of the dip.

d) Weather: Hot, humid weather reduces persistency of dips but does not ablate it. Most of our work shows ~ 1 day less persistency in hot humid weather (even with excellent teat preparation including drying) related to skin surface moisture interactions. It was 102°F and 120° heat index that day (very hot and humid).

4. Results from a simultaneous dry cow dipping trial:
During this trial, a simultaneous trial was being conducted with other experimental products vs. a commercial (430-9-3) persistent barrier dry cow teat dip (see tables 1-2 on following page). This shows that other dips were able to show persistency even though weather was hot and humid (commercial dip showed ~ .5-1 day less persistence than normal).

Overall Summary

A novel 2 compound teat dip system for prevention of dry period mastitis was evaluated for teat tissue persistency and coverage. The compounds were easy to apply and formed a nice polymerized film. However, only 1/24 teats had dip films on @ 12 hrs post dipping with most films cracking, peeling, or completely removed by that time.

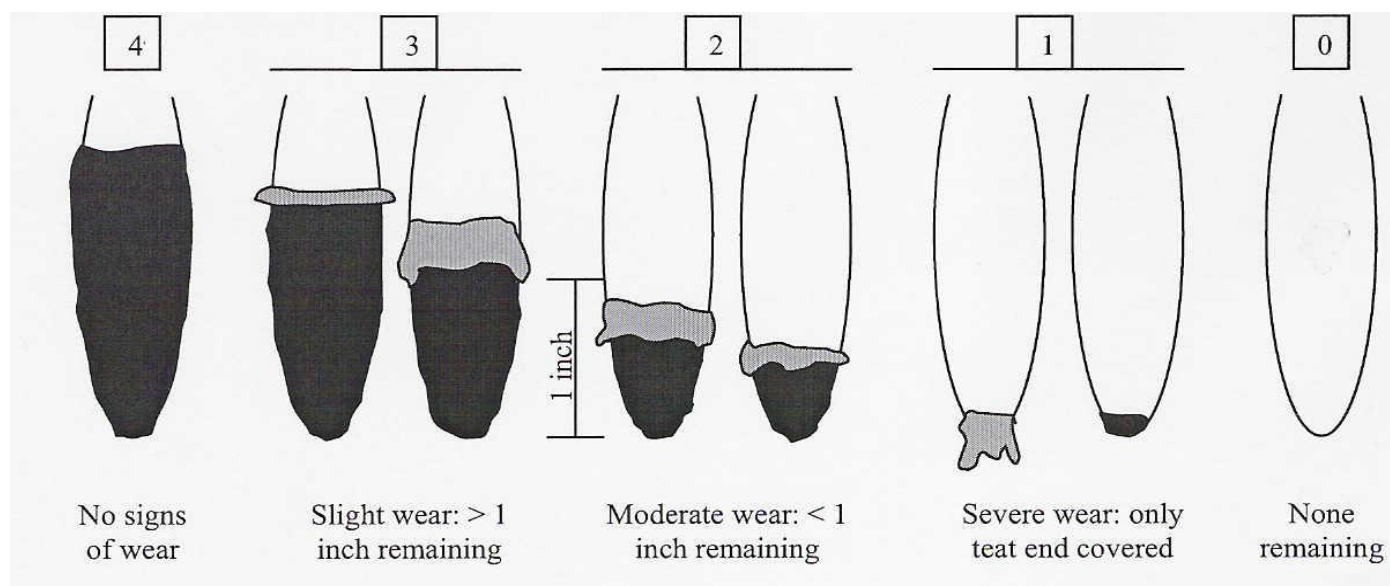


Figure 1. Persistency scoring of dry cow teat dip sealants.

Table 1. Adherence of external teats sealants on quarters of dry cows over a period of 5d after initial application

Treatment	Hours	Quarters (n)					Coverage teat end (%)
		Score 4	Score 3	Score 2	Score 1	Score 0	
430-9-1	24	10	0	0	1	0	100%
	48	3	3	1	3	1	91%
	72	0	4	1	3	3	73%
	96	0	0	1	0	10	9%
	120	0	0	0	0	11	0%
430-9-2	24	10	0	1	0	0	100%
	48	2	5	2	2	0	100%
	72	1	4	1	1	4	64%
	96	0	0	3	0	8	27%
	120	0	0	1	0	10	9%
430-9-3	24	9	2	0	0	0	100%
	48	2	5	2	1	1	91%
	72	0	4	3	2	2	82%
	96	0	0	5	2	4	64%
	120	0	0	1	2	8	27%
430-9-4	24	10	1	0	0	0	100%
	48	0	4	1	2	4	64%
	72	0	0	3	0	8	27%
	96	0	0	2	0	9	18%
	120	0	0	0	1	10	9%
Total		47	32	28	20	93	58%

Table 2. Adherence of external teats sealants on quarters of heifers over a period of 5d after initial application

Treatment	Hours	Quarters (n)					Coverage teat end (%)
		Score 4	Score 3	Score 2	Score 1	Score 0	
430-9-1	24	2	2	0	1	0	100%
	48	0	2	0	0	3	40%
	72	0	0	0	1	4	20%
	96	0	0	0	0	5	0%
	120	0	0	0	0	5	0%
430-9-2	24	2	0	0	0	3	40%
	48	0	0	0	0	5	0%
	72	0	0	0	0	5	0%
	96	0	0	0	0	5	0%
	120	0	0	0	0	5	0%
430-9-3	24	2	2	0	0	1	80%
	48	0	1	2	0	2	60%
	72	0	1	0	1	3	40%
	96	0	0	0	1	4	20%
	120	0	0	0	1	4	20%
430-9-4	24	2	2	0	1	0	100%
	48	0	1	1	0	3	40%
	72	0	0	1	0	4	20%
	96	0	0	0	0	5	0%
	120	0	0	0	0	5	0%
Total		8	11	4	6	71	29%